Answers to problems set 1.1: P12-15(12, 28, 36)
Please look up questions from the textbook.

12.
a. $p \to q$: If you have the flu, then you miss the final examination.
b. $\neg q \leftrightarrow r$: You don't miss the final examination if and only if you pass the course.
c. $q \to \neg r$: If you miss the final examination, then you do not pass the course.
d. $p \lor q \lor r$: You have the flu or you miss the final examination or you pass the course.
e. $(p \to \neg r) \lor (q \to \neg r)$: If you have the flu, then you do not pass the course or if you miss the final examination, then you do not pass the course.
f. $(p \land q) \lor (\neg q \land r)$: You have the flu and you miss the final examination or you don't miss the final examination and you pass the course.

28.
A) Proposition: **If it snows tonight, then I will stay at home**
converse: If I stay at home then it snows tonight
i**nverse**: If it doesn't snow tonight then I will not stay at home
contrapositive: If I will not stay at home, then it doesn't snow tonight

B) Proposition: **I go to the beach whenever it is sunny summer day**
converse: If it sunny summer day, then I go to the beach
inverse: If I do not go the beach, then it is not sunny summer day
contrapositive: If it is not sunny summer day, then I do not go to the beach

C) Proposition: **When I stay up late, it is necessary that I sleep until noon**
converse: If I sleep until noon, then I stay up late
inverse: If I do not stay up late, then it is not necessary that I sleep until noon
contrapositive: If it is not necessary that I sleep until noon, then I do not stay up late

36.
A) $(p \lor q) \lor r$

p	q	r	$p \lor q$	$(p \lor q) \lor r$
T	T	T	T	T
T	T	F	T	T
T	F	T	T	T
T	F	F	T	T

F	T	T	T	T
F	T	F	T	T
F	F	T	F	T
F	F	F	F	F

B) $(p \lor q) \land r$

p	q	r	$p \lor q$	$(p \lor q) \land r$
T	T	T	T	T
T	T	F	T	F
T	F	T	T	T
T	F	F	T	F
F	T	T	T	T
F	T	F	T	F
F	F	T	F	F
F	F	F	F	F

C) $(p \land q) \lor r$

p	q	r	$p \land q$	$(p \land q) \lor r$
T	T	T	T	T
T	T	F	T	T
T	F	T	F	T
T	F	F	F	F
F	T	T	F	T
F	T	F	F	F

F	F	T	F	T
F	F	F	F	F

D) $(p \wedge q) \wedge r$

p	q	r	$p \wedge q$	$(p \wedge q) \wedge r$
T	T	T	T	T
T	T	F	T	F
T	F	T	F	F
T	F	F	F	F
F	T	T	F	F
F	T	F	F	F
F	F	T	F	F
F	F	F	F	F

E) $(p \vee q) \wedge \neg r$

p	q	r	$\neg r$	$p \vee q$	$(p \vee q) \wedge \neg r$
T	T	T	F	T	F
T	T	F	T	T	T
T	F	T	F	T	F
T	F	F	T	T	T
F	T	T	F	T	F
F	T	F	T	T	T
F	F	T	F	F	F
F	F	F	T	F	F

F) $(p \wedge q) \vee \neg r$

p	q	r	$\neg r$	$p \wedge q$	$(p \wedge q) \vee \neg r$
T	T	T	F	T	T
T	T	F	T	T	T
T	F	T	F	F	F
T	F	F	T	F	T
F	T	T	F	F	F
F	T	F	T	F	T
F	F	T	F	F	F
F	F	F	T	F	T